How farmers make ‘sense’ from sensor data

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Introduction

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- Van der Tol, 2010
  - “It reached an SN and SP of 84.62% and 99.43%, respectively. It indicated a practical feasible and accurate CM detecting model for using in AMS”
- Buma, 2012
  - “74% of the clinical mastitis cases was not detected by the farmer”
- So what goes ‘wrong’?
  - What triggers a farmer to start treatment on a cow?

Farmers interpretation

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- Cow in heat
  - Voluntary waiting period
  - Expected culling of the cow
  - Recent disease

Approach

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- Worldwide data collected
- Filtered on treated for mastitis

- Information on:
  - Conductivity
  - Milk yield
  - Lactation
  - Attentions

- 79230 treatments left
  - 2504 farms
  - Seven countries

Explanation

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- Conductivity
  - Measured in ms but displayed as normalized value
  - Attention when increase fo 20%
- Interval
  - Days difference between first attention and treatment
  - Negative means attention occured before treatment

Statistics

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- Survival analysis
- Cox Hazard test

Severity on treatment day

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Parameter	Estimate	Std. Error	p < 0.001
(Intercept)	96.63	0.295	*
TreatmentDay_MilkYield	-1.08	0.012	*
TreatmentDay_ExpectedYield	0.65	0.012	*
LactationNumber	1.34	0.035	*
LactationDay	-0.02	0.001	*
Interval_Cdt	-0.13	0.005	*
Attention_BigMilkDrop	-0.83	0.204	*
Attention_Color	-2.69	0.117	*

- Linear model
  - r = 0.46

Survival time to treatment

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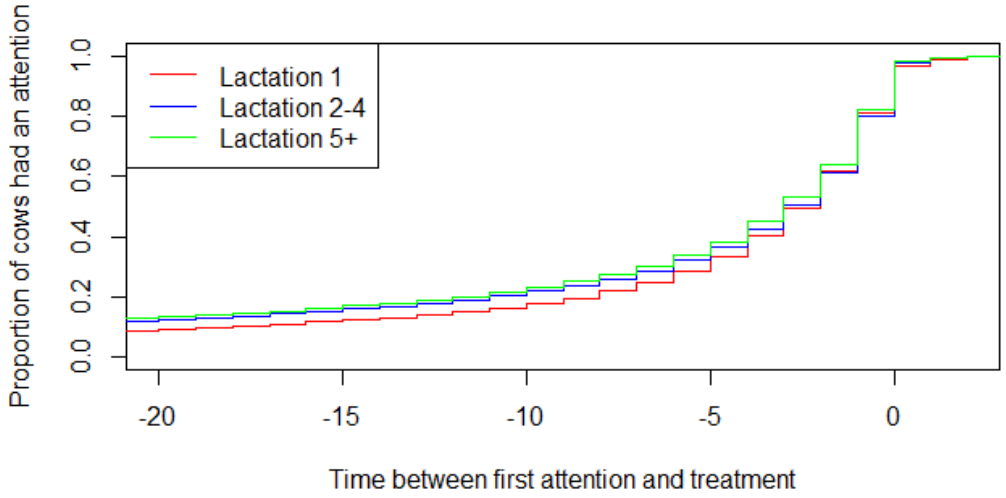
	coefficient	exp(coef)	effect	sig.
Lactation number	0.019	1.020	2.0%	*
Lactation day	0.001	1.001	0.1%	*
TreatmentDay MilkYield	0.024	1.025	2.5%	*
TreatmentDay ExpectedYield	-0.018	0.982	-1.8%	*
Attention BigMilkDrop	-0.208	0.813	-18.7%	*
Attention Color	-0.700	0.497	-50.3%	*
TreatmentDay Cdt	0.006	1.006	0.6%	*

Lactation	*Day*	*Yield*	*Exp. Yield*	*Milk drop*	*Color*	Total
1	*60*	*20*	*35*	*Yes*	*Yes*	
4	*200*	*20*	*25*	*Yes*	*No*	
3 * 2 = 6	***140 * 0.1 = 14***	***0 * 2.5 = 0***	***-10 * -1.8 = 18***	***0***	***50***	**88%**

- Cow 2 has 88% chance to have an extra day between first attention and treatment

Effect of lactation



- $p = 1.11\ e^{-15}$
- High lactation cows are longer on list before treatment
- Fact: older cows have longer interval between first attention and moment of treatment.

Effect of expected milk yield

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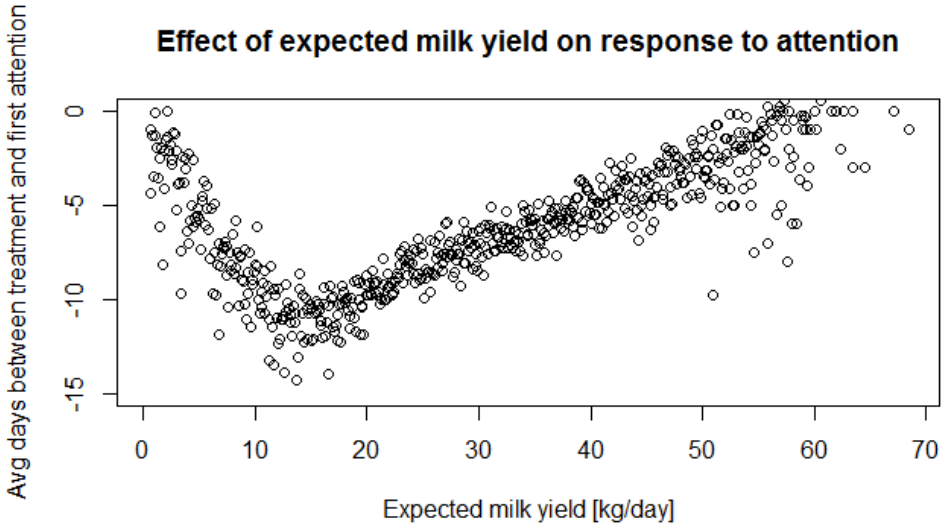
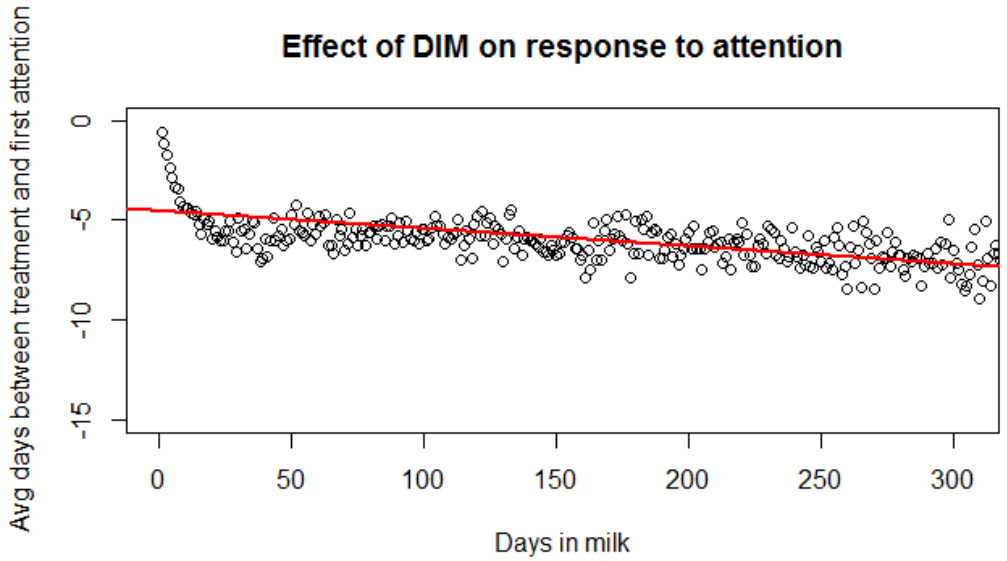


- High yielding cows and cows with low yield are treated faster
  - ➔ high potential (expected > 30)
  - ➔ severe cases (expected < 10)

Effect of days in milk



- Linear regression showed effect of -0.007 day/day
- Cows further in lactation are longer on the attention list before treatment

Conclusion

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- Farmers make an economic decision to treat
  - Farmers are triggered to treat by low and high yielding cows
  - Lactation stage affects the treatment trigger
  - First lactation cows a treated faster compared to older cows

Thank you for your attention

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